

## Unit 7.2. MCQs Set 1

### Results



#### #1. Q1. In comparing plant and animal cells, which statement is correct?

- ☐ (A). Both lack membrane-bound organelles
- ☐ (B). Only plant cells have mitochondria, animal cells do not
- ☐ (C). Plant cells contain a cell wall (cellulose), chloroplasts for photosynthesis, large central vacuole; animal cells typically lack these
- ☐ (D). Both contain chloroplasts by default

Plant cells have a rigid cell wall, chloroplasts for photosynthesis, and a large central vacuole, features that animal cells generally lack.

#### #2. Q2. Early experiments proving DNA as genetic material included:

- ☐ (A). Morgan's fruit fly crosses
- ☐ (B). Griffith's transformation experiment with *Streptococcus pneumoniae*, followed by Avery-MacLeod-McCarty and Hershey-Chase experiments
- ☐ (C). Meselson-Stahl experiment only
- ☐ (D). None

Griffith's experiment showed the transforming principle, Avery-MacLeod-McCarty identified it as DNA, and Hershey-Chase confirmed DNA's role in heredity.

#### #3. Q3. Chemistry of nucleic acids reveals each nucleotide has:

- ☐ (A). Amino acids, methyl groups, sulfate
- ☐ (B). A phosphate group, a sugar (ribose or deoxyribose), and a nitrogenous base
- ☐ (C). Only lipids





- ☐  
(D). None

Each nucleotide is made up of a phosphate group, a sugar (ribose in RNA or deoxyribose in DNA), and a nitrogenous base.

**#4. Q4. Chargaff's rule states that in DNA,**

- ☐  
(A). A = G always  
☐  
(B). A + T = C + G  
☐  
(C). %A = %T and %G = %C  
☐  
(D). None

Chargaff's rule shows that in double-stranded DNA, the amount of adenine equals thymine, and guanine equals cytosine.

**#5. Q5. The Watson-Crick model of DNA proposed**

- ☐  
(A). A triple helix structure  
☐  
(B). A double-stranded helix with antiparallel strands, bases paired A-T and G-C  
☐  
(C). None  
☐  
(D). No hydrogen bonds

The Watson-Crick model describes a double helix with complementary base pairing and antiparallel strands.

**#6. Q6. DNA can have different forms (A, B, Z). The "B-form" is**

- ☐  
(A). Most common physiological form, right-handed helix  
☐  
(B). Left-handed helix  
☐  
(C). None  
☐  
(D). Single-stranded in cells

B-DNA is the most common form found under physiological conditions; it is a right-handed helix.

**#7. Q7. Types of RNA do not include**

- ☐  
(A). mRNA, tRNA, rRNA  
☐  
(B). siRNA, miRNA, snRNA  
☐  
(C). RBC doping  
☐  
(D). None

'RBC doping' is not a type of RNA; all others are recognized classes of RNA.

**#8. Q8. Concept of a "gene" historically means**

- ☐  
(A). None





- ☐  
(B). A unit of inheritance controlling a trait, eventually known as a DNA segment coding for a functional product  
☐  
(C). RBC doping  
☐  
(D). Infectious illusions

Historically, a gene is considered a unit of heredity that governs a trait, later identified as a DNA segment coding for a product.

**#9. Q9. The difference between prokaryotic and eukaryotic genes typically is that**

- ☐  
(A). None  
☐  
(B). Eukaryotic genes often have introns, promoters/enhancers, while prokaryotic genes are mostly contiguous coding regions  
☐  
(C). RBC doping  
☐  
(D). Infectious illusions

Eukaryotic genes contain introns and complex regulatory elements, unlike most prokaryotic genes which are continuous.

**#10. Q10. The “C-value paradox” addresses**

- ☐  
(A). None  
☐  
(B). The lack of correlation between organismal complexity and genome size  
☐  
(C). RBC doping  
☐  
(D). Infectious illusions

The C-value paradox refers to the observation that genome size does not consistently correlate with an organism's complexity.

**#11. Q11. Triplexes, quadruplexes, and aptamers refer to**

- ☐  
(A). None  
☐  
(B). Non-canonical DNA/RNA structures (e.g., triple-stranded DNA, G-quadruplexes, aptamer folding)  
☐  
(C). RBC doping  
☐  
(D). Infectious illusions

These terms denote unusual structural conformations in nucleic acids beyond the classical double helix.

**#12. Q12. DNA replication: the semi-conservative model was confirmed by**

- ☐  
(A). Griffith's transformation  
☐  
(B). Meselson-Stahl experiment  
☐  
(C). None  
☐  
(D). RBC doping





The Meselson-Stahl experiment demonstrated that each new DNA molecule consists of one old and one new strand, supporting the semi-conservative model.

**#13. Q13. The “dispersive model” of replication was disproven because**

- ☐ (A). None
- ☐ (B). Meselson-Stahl’s results showed a pattern consistent with semi-conservative replication
- ☐ (C). RBC doping
- ☐ (D). Infectious illusions

The experimental results did not support the dispersive model, but were in line with semi-conservative replication.

**#14. Q14. DNA replicative enzymes do not include**

- ☐ (A). Helicase
- ☐ (B). DNA polymerase
- ☐ (C). Min. synergy
- ☐ (D). DNA ligase

‘Min. synergy’ is not an enzyme; helicase, DNA polymerase, and DNA ligase are involved in replication.

**#15. Q15. Mechanism of DNA replication in prokaryotes involves**

- ☐ (A). None
- ☐ (B). A single origin of replication (OriC) with bidirectional replication forks
- ☐ (C). RBC doping
- ☐ (D). Infectious illusions

Prokaryotic chromosomes typically replicate from a single origin with bidirectional forks.

**#16. Q16. Types of gene mutations: “base substitution” can be**

- ☐ (A). Missense, nonsense, or silent
- ☐ (B). None
- ☐ (C). RBC doping
- ☐ (D). Infectious illusions

Base substitution mutations can result in a missense change (different amino acid), a nonsense mutation (stop codon), or a silent mutation (no amino acid change).

**#17. Q17. Frameshift mutation arises from**

- ☐ (A). None





- ☐ (B). Insertion or deletion of nucleotides not in multiples of three, causing a shift in the reading frame
- ☐ (C). RBC doping
- ☐ (D). Infectious illusions

Frameshift mutations disrupt the reading frame of the gene, potentially altering all downstream codons.

**#18. Q18. DNA damage and repair mechanisms: “nucleotide excision repair” deals with**

- ☐ (A). None
- ☐ (B). Removal of bulky lesions such as thymine dimers and replacement with correct nucleotides
- ☐ (C). RBC doping
- ☐ (D). Infectious illusions

Nucleotide excision repair specifically targets bulky, helix-distorting lesions in DNA.

**#19. Q19. Gene expression in prokaryotes typically features**

- ☐ (A). None
- ☐ (B). Polycistronic mRNA, a single RNA polymerase, and no introns
- ☐ (C). RBC doping
- ☐ (D). Infectious illusions

Prokaryotic genes are usually organized in operons and transcribed into polycistronic mRNA without introns.

**#20. Q20. The structure of a typical prokaryotic gene includes**

- ☐ (A). None
- ☐ (B). A promoter (with -35 and -10 regions), an operator or regulatory sequence, and a continuous coding region
- ☐ (C). RBC doping
- ☐ (D). Infectious illusions

Prokaryotic genes are generally uninterrupted and are regulated by nearby promoter and operator sequences.

**#21. Q21. Prokaryotic RNA polymerase has subunits**

- ☐ (A). None
- ☐ (B).  $\alpha$ ,  $\beta$ ,  $\beta'$ , and  $\sigma$  factor for initiation
- ☐ (C). RBC doping
- ☐ (D). Infectious illusions

The core enzyme is composed of  $\alpha$ ,  $\beta$ , and  $\beta'$  subunits and the  $\sigma$  factor is necessary for promoter recognition during initiation.





**#22. Q22. Mechanism of gene transcription includes**

- ☐ (A). None
- ☐ (B). Initiation at the promoter, elongation (5'→3' synthesis), and termination at specific signals
- ☐ (C). RBC doping
- ☐ (D). Infectious illusions

Transcription proceeds in three phases: initiation, elongation, and termination.

**#23. Q23. Translation: the genetic code**

- ☐ (A). None
- ☐ (B). Is read in triplets (codons), each specifying an amino acid or a stop signal
- ☐ (C). RBC doping
- ☐ (D). Infectious illusions

The genetic code is read in codons, where each triplet corresponds to a specific amino acid or a termination signal.

**#24. Q24. Gene structure in eukaryotes typically**

- ☐ (A). None
- ☐ (B). Consists of exons and introns with promoter elements like the TATA box, requiring splicing of pre-mRNA
- ☐ (C). RBC doping
- ☐ (D). Infectious illusions

Eukaryotic genes contain introns and exons; introns are removed during RNA splicing to form mature mRNA.

**#25. Q25. RNA polymerases in eukaryotes:**

- ☐ (A). None
- ☐ (B). RNA Pol I synthesizes rRNA, RNA Pol II synthesizes mRNA, and RNA Pol III synthesizes tRNA (and some rRNA)
- ☐ (C). RBC doping
- ☐ (D). Infectious illusions

Eukaryotic cells use three distinct RNA polymerases with specific roles in RNA synthesis.

**#26. Q26. Post-transcriptional modifications in eukaryotes include**

- ☐ (A). None
- ☐ (B). Addition of a 5' cap, addition of a 3' poly-A tail, and splicing of pre-mRNA
- ☐ (C). RBC doping
- ☐ (D). Infectious illusions





Eukaryotic pre-mRNA undergoes several modifications before translation, including capping, polyadenylation, and splicing.

**#27. Q27. The Operon concept (e.g., lac operon) in prokaryotes exemplifies**

- ☐ (A). None
- ☐ (B). A cluster of genes under a single promoter that is regulated collectively by a repressor or activator
- ☐ (C). RBC doping
- ☐ (D). Infectious illusions

The lac operon is a classic model of gene regulation in prokaryotes, where multiple genes are co-regulated.

**#28. Q28. Basic concepts of Genetic Engineering might involve**

- ☐ (A). None
- ☐ (B). Recombinant DNA technology, use of plasmids, restriction enzymes, DNA ligase, and transformation techniques
- ☐ (C). RBC doping
- ☐ (D). Infectious illusions

Genetic engineering relies on tools like restriction enzymes and vectors to manipulate DNA.

**#29. Q29. Restriction enzymes in molecular biology are**

- ☐ (A). None
- ☐ (B). Enzymes that cut DNA at specific palindromic sequences
- ☐ (C). RBC doping
- ☐ (D). Infectious illusions

Restriction enzymes cleave DNA at defined sequences, typically palindromic regions.

**#30. Q30. DNA ligase**

- ☐ (A). None
- ☐ (B). Joins Okazaki fragments during replication and seals nicks in recombinant DNA molecules
- ☐ (C). RBC doping
- ☐ (D). Infectious illusions

DNA ligase forms phosphodiester bonds between adjacent DNA fragments during replication and in recombinant DNA constructs.

**#31. Q31. Plasmid vectors generally contain**

- ☐ (A). None
- ☐ (B). An origin of replication, a selectable marker, and a multiple cloning site





- ☐
- (C). RBC doping
- ☐
- (D). Infectious illusions

Plasmid vectors are engineered to include essential elements for replication and selection within host cells.

### #32. Q32. Transformation in cloning means

- ☐
- (A). None
- ☐
- (B). The introduction of a recombinant plasmid into bacteria, which then become transformants
- ☐
- (C). RBC doping
- ☐
- (D). Infectious illusions

Transformation is the process where competent bacterial cells take up recombinant plasmid DNA.

### #33. Q33. Early evidence for DNA as genetic material: Avery, MacLeod, and McCarty showed

- ☐
- (A). None
- ☐
- (B). DNA from virulent bacteria could transform non-virulent strains
- ☐
- (C). RBC doping
- ☐
- (D). Infectious illusions

Their experiments demonstrated that DNA, not protein, was responsible for transforming bacterial phenotypes.

### #34. Q34. Hershey-Chase used radioisotopes

- ☐
- (A). None
- ☐
- (B).  $^{32}\text{P}$  labeled DNA and  $^{35}\text{S}$  labeled protein; only the  $^{32}\text{P}$  label entered bacterial cells, proving DNA is the hereditary material
- ☐
- (C). RBC doping
- ☐
- (D). Infectious illusions

The Hershey-Chase experiment confirmed that DNA is the genetic material as only the radiolabeled DNA entered the bacterial cells.

### #35. Q35. Nucleic acids' "phosphodiester bond" is between

- ☐
- (A). None
- ☐
- (B). The 3'-OH of one sugar and the 5'-phosphate of the next nucleotide
- ☐
- (C). RBC doping
- ☐
- (D). Infectious illusions

The phosphodiester bond connects the 3' hydroxyl group of one nucleotide to the 5' phosphate group of the next, forming the backbone of DNA and RNA.





**#36. Q36. The “semi-discontinuous” replication in eukaryotes refers to**

- ☐ (A). None
- ☐ (B). Continuous synthesis of the leading strand and discontinuous synthesis (Okazaki fragments) of the lagging strand
- ☐ (C). RBC doping
- ☐ (D). Infectious illusions

During replication, the leading strand is made continuously while the lagging strand is synthesized in short segments.

**#37. Q37. Proofreading during DNA replication is mainly performed by**

- ☐ (A). None
- ☐ (B). The 3'→5' exonuclease activity of DNA polymerase
- ☐ (C). RBC doping
- ☐ (D). Infectious illusions

DNA polymerase's 3'→5' exonuclease activity removes misincorporated nucleotides during replication.

**#38. Q38. DNA mismatch repair system fixes**

- ☐ (A). None
- ☐ (B). Base-base mismatches left after replication if proofreading fails
- ☐ (C). RBC doping
- ☐ (D). Infectious illusions

The mismatch repair system identifies and corrects errors that escape the proofreading activity of DNA polymerase.

**#39. Q39. Transcription in eukaryotes vs. prokaryotes differs because eukaryotes**

- ☐ (A). None
- ☐ (B). Have three nuclear RNA polymerases and extensive post-transcriptional modifications such as splicing, 5' capping, and 3' polyadenylation
- ☐ (C). RBC doping
- ☐ (D). Infectious illusions

Eukaryotic transcription is more complex due to the presence of multiple RNA polymerases and mRNA processing events.

**#40. Q40. Translation in prokaryotes can initiate even before transcription ends because**

- ☐ (A). None
- ☐ (B). They lack a nuclear membrane, allowing transcription and translation to be coupled
- ☐ (C). RBC doping
- ☐





(D). Infectious illusions

In prokaryotes, the absence of a nuclear envelope permits simultaneous transcription and translation.

**#41. Q41. The genetic code is “degenerate” meaning**

- ☐ (A). None
- ☐ (B). Multiple codons can encode the same amino acid
- ☐ (C). RBC doping
- ☐ (D). Infectious illusions

Degeneracy of the genetic code means that there is redundancy, with several codons capable of coding for the same amino acid.

**#42. Q42. Post-transcriptional modifications in eukaryotes do not include**

- ☐ (A). None
- ☐ (B). 5' capping
- ☐ (C). 3' poly-A tail
- ☐ (D). Removal of exons

Exons are retained in the mature mRNA; instead, introns are removed during RNA processing.

**#43. Q43. The lac operon is induced in E. coli when**

- ☐ (A). None
- ☐ (B). Lactose is present, binding to the repressor and permitting transcription of the lac genes
- ☐ (C). RBC doping
- ☐ (D). Infectious illusions

When lactose is available, it binds to the lac repressor, lifting repression and allowing the operon to be transcribed.

**#44. Q44. Basic concept in Genetic Engineering: “Cloning vector” must have**

- ☐ (A). None
- ☐ (B). An origin of replication, a selectable marker, and a unique multiple cloning site (MCS)
- ☐ (C). RBC doping
- ☐ (D). Infectious illusions

A cloning vector requires these elements to successfully propagate and select for inserted DNA in host cells.





**#45. Q45. "Competent cells" are**

- ☐ (A). None
- ☐ (B). Bacterial cells that have been treated (e.g., with  $\text{CaCl}_2$ ) or electroporated to enable DNA uptake
- ☐ (C). RBC doping
- ☐ (D). Infectious illusions

Competent cells are prepared to be permeable to DNA, facilitating the transformation process.

**#46. Q46. Restriction-fragment length polymorphism (RFLP) analysis:**

- ☐ (A). None
- ☐ (B). Variation in DNA sequences causes differences in restriction enzyme cutting patterns, used for genetic mapping or forensic analysis
- ☐ (C). RBC doping
- ☐ (D). Infectious illusions

RFLP analysis relies on variable fragment lengths due to differences in DNA sequence and restriction enzyme recognition sites.

**#47. Q47. PCR (Polymerase Chain Reaction) key steps are**

- ☐ (A). None
- ☐ (B). Denaturation, annealing, and extension
- ☐ (C). RBC doping
- ☐ (D). Infectious illusions

PCR amplifies DNA by cycling through denaturation, annealing of primers, and extension by DNA polymerase.

**#48. Q48. Southern blot is used to**

- ☐ (A). None
- ☐ (B). Detect specific DNA fragments after gel electrophoresis by hybridizing with a labeled probe
- ☐ (C). RBC doping
- ☐ (D). Infectious illusions

Southern blotting involves transferring separated DNA fragments to a membrane and hybridizing with a specific probe to detect a target sequence.

**#49. Q49. Gene expression regulation in eukaryotes can occur at**

- ☐ (A). None
- ☐ (B). Multiple levels such as transcription initiation, RNA processing, mRNA transport/stability, translation, and post-





translational modifications

☐

(C). RBC doping

☐

(D). Infectious illusions

Eukaryotic gene expression is highly regulated at several steps from transcription to translation and post-translational modification.

**#50. Q50. Biotechnology example: producing insulin by**

☐

(A). None

☐

(B). Cloning the human insulin gene into a bacterial expression system and purifying recombinant insulin

☐

(C). RBC doping

☐

(D). Infectious illusions

Recombinant insulin is produced by inserting the human insulin gene into bacteria (or yeast), expressing the protein, and purifying it.

[Previous](#)

[Submit](#)